Marked-Up Version of Amendments Submitted With Amendment; Response To Office Action Mailed October 31, 2002

In the Specification:

On page 30, the paragraph beginning on line 1:

"Hydrocarbons" are generally defined as ~~organic material that contains carbon and hydrogen in their molecular structures~~molecules formed primarily by carbon and hydrogen atoms. Hydrocarbons may also include other elements, such as, but not limited to, halogens, metallic elements, nitrogen, oxygen, and/or sulfur.

On page 53, the paragraph beginning on line 20:

As shown in FIG. 3, in addition to heat sources 100, one or more production wells ~~102~~ 104 will typically be disposed within the portion of the coal formation. Formation fluids may be produced through production well 104. ~~Production well 102 may be configured such that a mixture that may include formation fluids may be produced through the production well.~~ Production well ~~102~~ 104 may also include a heat source. In this manner, the formation fluids may be maintained at a selected temperature throughout production, thereby allowing more or all of the formation fluids to be produced as vapors. Therefore high temperature pumping of liquids from the production well may be reduced or substantially eliminated, which in turn decreases production costs. Providing heating at or through the production well tends to: (1) ~~prevent~~ inhibit condensation and/or refluxing of production fluid when such production fluid is moving in the production well proximate to the overburden, (2) increase heat input into the formation, and/or (3) increase formation permeability at or proximate the production well.

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In the Claims:

2619. (amended) A method of treating a coal formation in situ, comprising:

heating a ~~selected section~~part of the formation with ~~a~~ heating elements, wherein at least two of the heating elements are placed ~~within a~~ in open wellbores, wherein at least one end of ~~the~~ at least one of the heating elements is free to move axially within ~~the~~ one of the open wellbores to allow for thermal expansion of the at least one heating element, and wherein superposition of heat from two of the heating elements raises a temperature of the part between the two heating elements to a temperature within a pyrolysis temperature range in order to pyrolyze at least some hydrocarbons in the part of the formation.

2621. (amended) The method of claim 2619, further comprising maintaining a temperature within a majority of the ~~selected section~~part within ~~a~~ the pyrolysis temperature range during pyrolysis, and wherein the pyrolysis temperature range spans from about 250 °C to about 370 °C.

2622. (amended) The method of claim 2619, wherein ~~the~~at least one of the heating elements comprises a pipe-in-pipe heater.

2623. (amended) The method of claim 2619, wherein ~~the~~ at least one of the heating elements comprises a flameless distributed combustor.

2624. (amended) The method of claim 2619, wherein ~~the~~at least one of the heating elements comprises a mineral insulated cable coupled to a support, and wherein the support is free to move within at least one of the ~~wellbore~~wellbores.

2625. (amended) The method of claim 2619, wherein ~~the~~at least one of the heating elements comprises a mineral insulated cable suspended from a wellhead.

2626. (amended) The method of claim 2619, further comprising controlling a pressure and a temperature within at least a majority of ~~a heated~~ the ~~section~~ part of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function

of pressure.

2627. (amended) The method of claim 2619, further comprising controlling the heat such that an average heating rate of the heated partsection is less than about 1 °C per day ~~during~~in a pyrolysis temperature range of about 270 °C to about 400 °C.

2628. (amended) The method of claim 2619, wherein heating the partsection of the formation further comprises:

heating a selected volume (V) of the coal formation from ~~the~~at least one of the heating elements, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day *(Pwr)* provided to the selected volume is equal to or less than $h*V*C_v*\rho_B$, wherein ρ_B is formation bulk density, and wherein an average heating rate *(h)* of the selected volume is about 10 °C/day~~wherein heating energy/day provided to the volume is equal to or less than *Pwr*, wherein *Pwr* is calculated by the equation:~~

~~$Pwr = h*V*C_v*\rho_B$~~

~~wherein *Pwr* is the heating energy/day, *h* is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day~~.

2629. (amended) The method of claim 2619, wherein heating the partsection of the formation comprises transferring heat substantially by conduction.

2630. (amended) The method of claim 2619, further comprising heating the ~~selected section~~part of the formation ~~such that~~to increase a thermal conductivity of the ~~selected section~~part ~~is~~ to greater than about 0.5 W/(m °C).

2642. (amended) The method of claim 2619, further comprising producing a mixture from the formation, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises molecular hydrogen, wherein the molecular hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the

molecular hydrogen is less than about 80 % by volume of the non-condensable component at 25 °C and one atmosphere absolute pressure.

2645. (amended) The method of claim 2619, further comprising controlling a pressure within the ~~selected section~~part of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

2650. (amended) The method of claim 2619, further comprising:

providing hydrogen (H_2) to the heated part~~section~~ to hydrogenate hydrocarbons within the heated part~~section~~; and

heating a portion of the part~~section~~ with heat from hydrogenation.

2651. (amended) The method of claim 2619, further comprising:

producing hydrogen (H_2) and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

2652. (amended) The method of claim 2619, wherein heating ~~comprises increasing~~increases a permeability of a majority of the heated part~~section~~ to greater than about 100 millidarcy.

2653. (amended) The method of claim 2619, wherein heating ~~comprises substantially uniformly increasing~~increases a permeability of a majority of the heated part~~section~~, such that the permeability of the majority of the part of the formation is substantially uniform.

2655. (amended) The method of claim 2619, further comprising producing a mixture in a production well, and wherein at least about 7 ~~heat sources~~heating elements are disposed in the formation for each production well.

2656. (amended) The method of claim 2619, further comprising providing heat from three or more ~~heat sources~~heating elements to at least a portion of the formation, wherein three or more

of the ~~heat sources~~heating elements are located in the formation in a unit of ~~heat sources~~heating elements, and wherein the unit of ~~heat sources~~heating elements comprises a triangular pattern.

2657. (amended) The method of claim 2619, further comprising providing heat from three or more ~~heat sources~~ heating elements to at least a portion of the formation, wherein three or more of the ~~heat sources~~heating elements are located in the formation in a unit of ~~heat sources~~heating elements, wherein the unit of ~~heat sources~~heating elements comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

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